

Status of the Higgs Sensitivity Study

Boaz Klima
Fermilab



**For the CDF and DØ
Higgs Sensitivity Group**



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The Tevatron Collider Collaborations



Between CDF and DØ there are 243 identified Run II Ph.D. thesis projects

More than 50% non-US: a central part of the World Program



**12 countries, 59 institutions
706 physicists**



**18 countries, 78 institutions
650 physicists**





Talks and Contributions

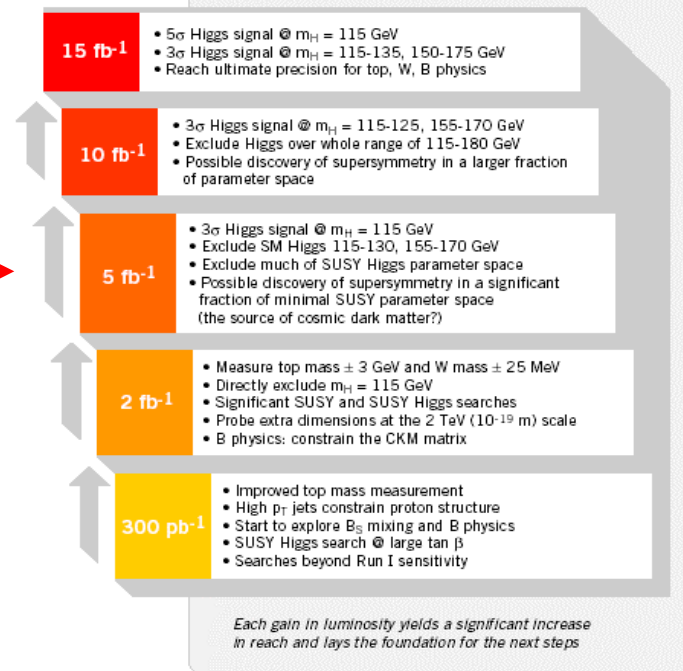
- Introduction + The Final Answer (BK)
- The CDF Analysis (Brian Winer, Ohio State University)
- The DØ Analysis (BK)
- **The CDF Team:** Joseph Kroll (Penn, co-chair), Brian Winer (OSU, co-chair), John Conway (Rutgers), Tommaso Dorigo (Padova), Tom Junk (Illinois), Martin Hennecke (Karlsruhe), Mario Martinez (FNAL/Barcelona), Pete McNamara (Rutgers), Luca Scodellaro (Padova), Fumi Ukegawa (Tsukuba), and Weiming Yao (LBNL)
- **The DØ Team:** Boaz Klima (Fermilab, chair), Levan Babukhadia (Stony Brook), Wade Fisher (Princeton), Anna Goussiou (Imperial College), Qizhong Li (Fermilab), Meenakshi Narain (Boston), Richard Partridge (Brown), Flera Rizatdinova (Kansas State), Chris Tully (Princeton), Andre Turcot (BNL), John Hobbs (Stony Brook), and Avto Kharchilava (Notre Dame)



The Run II Physics Program

- The Higgs search is very important
- By no means this is the only thing we are (and plan on) doing
- There is an extremely rich physics program - every time we double the integrated luminosity we open a new window (Top, Supersymmetry, Large Extra Dimension, ...)
- This is the frontier of HEP
- Fermilab and the two collaborations are committed to produce the most exciting physics
- Both experiments work very well and generating world-class physics results

(2002) Run II Physics Program

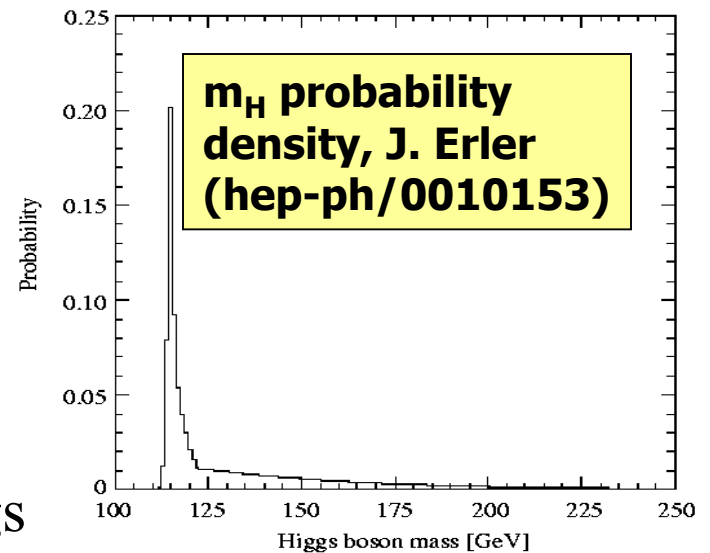


Conclusion - the Run II physics program at the frontier of HEP is very rich and we can take full advantage of this unique opportunity



What? Why?

- We were asked by DOE about 6 months ago to provide a new estimate (plot?) for the Higgs sensitivity during Run II based on our current understanding of detectors and analysis components and their projected performance as luminosity becomes available
- Timescale June '03 – very short!
- Concentrate on low mass end first
since Standard Model and
Supersymmetry prefer low mass Higgs





Strategy (CDF/DØ)

- Form a CDF/DØ working group (minimal overlap with current mainstream efforts)
- Base on Run II Working Group study (hep-ph/0010338)
- Split the work wherever possible, e.g.

CDF: $WH \rightarrow l\nu bb$, DØ: $ZH \rightarrow \nu\nu bb$

(the most sensitive modes)

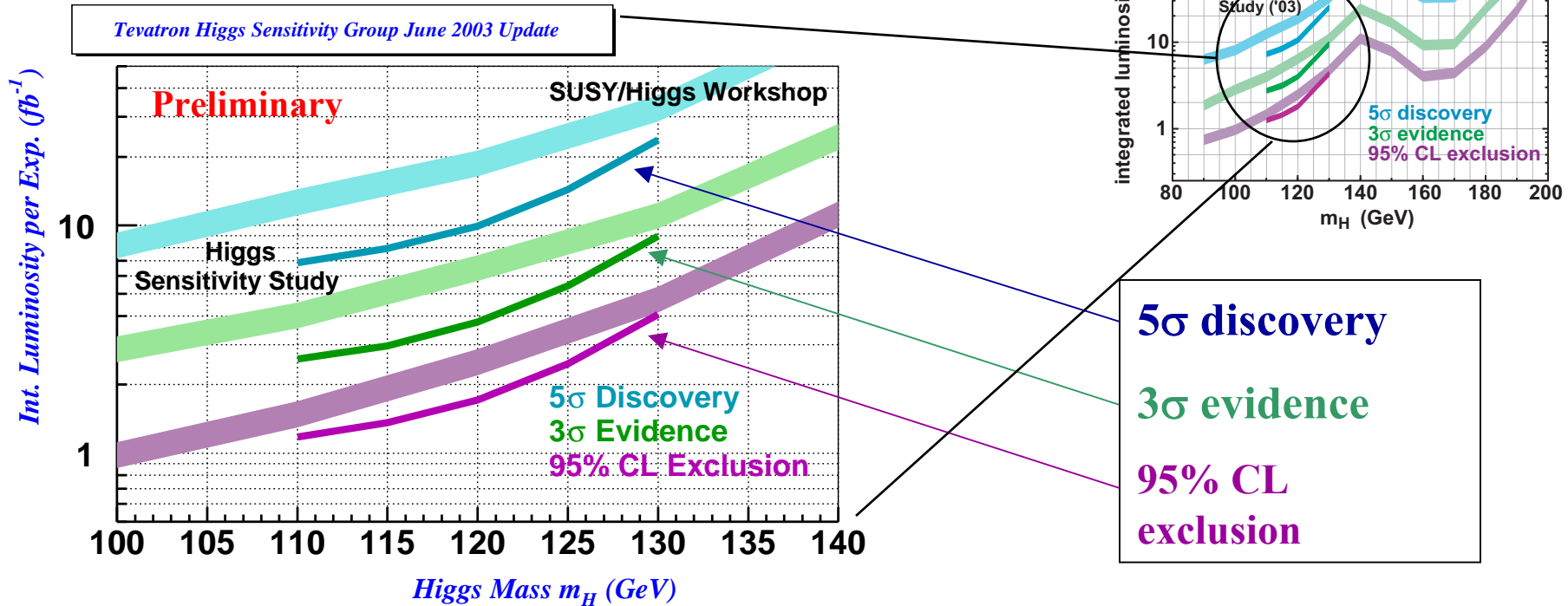
- Extensive documentation is available internally



Higgs Sensitivity

(Combined $\nu\bar{\nu}bb + l\bar{l}bb + l\nu\bar{\nu}b$)

Combined DØ/CDF Result



- No systematics included
- No $H \rightarrow WW$ channel added – impacts $m_H > 125 \text{ GeV}$

Improvement due mainly to sophisticated analysis techniques



Conclusions

- We are excited to work at HEP's frontier program
- The experiments are running very well, producing broad world-class physics results, and are committed to generating excellent physics until the end of the decade
- This study indicates that the Higgs reach at the Tevatron is at least as good as projected 4 years ago
- The understanding of the Higgs sensitivity will improve over time as we get more data, better understand our detectors, use smarter analysis techniques, and develop new ideas (remember the Top search during Run I – the final sensitivity was much better than expected)

We are looking forward to a long and exciting Physics program at the world's frontier energy